Office of the Superintendent of Financial Institutions Canada
Bureau du surintendant des institutions financières Canada

Measuring the Financial Sustainability of the Canada Pension Plan

Actuarial Study No. 10

January 2012
Office of the Chief Actuary

OSFI
BSIF

Canada

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I. Executive Summary

A. Purpose

This is the tenth actuarial study to be published by the Office of the Chief Actuary (OCA). This study was undertaken in response to Recommendation #4 made by the independent peer review panel that reviewed the 25th Actuarial Report on the Canada Pension Plan as at 31 December 2009[1] (the "25th CPP Actuarial Report"). All the findings in this study are based on the 25th CPP Actuarial Report.

The review panel recommended that only an actuarial balance sheet on an open group basis appear in the actuarial report. They further recommended providing more details and analysis of alternative actuarial balance sheets in an OCA actuarial study. This paper was thus written with the purpose of updating and enhancing Actuarial Study No. 8 "Technical Aspects of the Financing of the Canada Pension Plan", and analyzing the financial sustainability of the CPP using different measures, in particular, assets and liabilities of the Plan under various closed and open group methodologies. One of the objectives of this study is to assess whether discussed measures of the CPP's financial sustainability are consistent with its partial funding approach and take into account both major sources of the financing of the Plan's future expenditures: contributions and invested assets.

The study also discusses the applicability to the Canada Pension Plan of the measures used for assessing the financial sustainability of the U.S. Old-Age, Survivors, and Disability Insurance (OASDI) program and the Swedish Inkomstpension system.

B. Main Findings

Closed Group Without Future Accruals

The closed group without future accruals methodology assumes that there are no new entrants to the Plan. In addition, current Plan participants who are not receiving benefits at the valuation date are assumed to have no contributory earnings beyond that date. As such, there are no contributions flowing into the Plan beyond the valuation date. The CPP balance sheet under this methodology was presented in the 25th CPP Actuarial Report.

Using this methodology and under the best-estimate scenario of the 25th CPP Actuarial Report, the Plan's asset shortfall (assets less liabilities, this difference is termed "asset excess", if positive, or "asset shortfall", if negative) is $748 billion, and the assets represent 15% of the Plan's liabilities as at 31 December 2009.

Although the relative size of the asset excess or shortfall under the closed group approach may be used as a measure of the Plan's financial status, the balance sheet under this methodology does not reflect the nature of the partial funding approach whereby future contributions represent a major source of financing of future expenditures. Therefore, it is inappropriate to reach a conclusion regarding the Plan's financial sustainability considering only the asset shortfall under the closed group balance sheet.

[1] "The Review of the Twenty-Fifth Actuarial Report on the Canada Pension Plan" report by the CPP actuarial review panel and associated documents may be accessed at the following web site: http://www.osfi-bsif.gc.ca/osfi/index_e.aspx?DetailID=377

Closed Group With Future Accruals

The closed group with future accruals methodology allows current participants to continue contributing to the Plan and accrue future benefits. Under the best-estimate assumptions of the 25th CPP Actuarial Report, the inflow of future contributions exceeds the associated future outflow of benefits, thus reducing the asset shortfall compared to the closed group without future accruals. However, there still remains a substantial asset shortfall under this approach since it does not take into account future contributions from potential future new entrants as a major source of financing of the Plan.

As at 31 December 2009, the asset shortfall under this methodology is $509 billion and the Plan's assets represent 62% of its liabilities.

Open Group

Under the open group approach, the determination of the assets and liabilities includes future contributions and benefits for both current and future Plan members. Once again, the inflow of contributions exceeds the outflow of associated future benefits, and this reduces the asset shortfall compared to the closed groups. The CPP balance sheet under this methodology was presented for the first time in the 25th CPP Actuarial Report.

As at 31 December 2009, there is a slight asset shortfall of $7 billion, and the Plan's assets represent more than 99% of its liabilities.

The open group methodology is consistent with the partial funding approach of the CPP since it fully takes into account future contributions to the Plan as a source of financing of its future expenditures. As such, it represents the most appropriate methodology to be used if the Plan's financial sustainability is to be measured by means of its balance sheet.

Splitting of the CPP into Pay-As-You-Go and Funded Components on an Open Group Basis

Under an open group, the obligations of the Plan result from and are met to a large extent by the pay-as-you-go component. Under the best-estimate assumptions, the pay-as-you-go component accounts for 92% of the Plan's total obligations, whereas the funded component only accounts for 8% of the total obligations as at 31 December 2009. Although these relative proportions change over time, the Plan remains financed mostly on a pay-as-you-go basis.

The discount rates used to determine the present values of future cash flows of the Plan could be chosen in such way that they reflect the growth in the Plan's financing base, that is, the growth in the contributory base for the pay-as-you-go component and the expected return on the CPP assets for the funded component. With the discount rates chosen in this way, the asset shortfall remains at $7 billion as at 31 December 2009, and the pay-as-you-go component accounts for 97% of the Plan's total obligations.

Changes in the demographic and economic environments vary the extent of the Plan's exposure to financial market risk. Although the main source of financing the Plan's future expenditures are future contributions, the importance of the funded portion of the Plan should not be underestimated.

International Comparisons

Both the U.S. OASDI program and the Swedish Inkomstpension system use financial sustainability measures that reflect the largely pay-as-you-go nature of these social security schemes. The actuarial balance measure used for the U.S. OASDI program is based on an open

group approach. While the financial sustainability of the Swedish Inkomstpension system is assessed by means of a closed group balance sheet, the assets side of this balance sheet includes a "contribution asset". This contribution asset reflects the role played by future contributions in the financing of the Swedish system's accrued liabilities. The application of these two measures to the CPP confirms that the Plan is financially sustainable under the current legislated contribution rate of 9.9%.

C. Conclusion

Major amendments in 1997 (the "1997 Amendments") led to the change in financing of the Canada Pension Plan from a pay-as-you-go (PayGo) basis to a form of partial funding called steady-state funding. The 1997 Amendments, and particularly steady-state funding, restored the Plan's financial sustainability for current and future generations. The purpose of the steady-state financing methodology is to produce an asset/expenditure ratio that is relatively stable over time. According to the 25th CPP Actuarial Report, under the legislated contribution rate of 9.9%, the Plan's assets are expected to increase significantly, with the asset/expenditure ratio growing from 3.9 in 2010 to about 4.7 by 2020 and to 5.2 by 2050. Although a number of indicators may be used to assess the Plan's financial sustainability, the key financial measure for evaluating the Plan is the steady-state contribution rate, specifically, its adequacy and stability over time.

Partially funded systems, as well as pay-as-you-go ones, represent social contracts where, in any given year, current contributors allow the use of their contributions to pay current beneficiaries' benefits. As a result, such social contracts create claims for current and past contributors to contributions of future contributors. The proper assessment of the financial sustainability of a social security pay-as-you-go or partially funded system by means of its balance sheet should take into account these claims. The traditional closed group methodologies do not reflect these claims since only current participants are considered. In comparison, the open group approach does account explicitly for these claims by considering the benefits and contributions of both the current and future plan participants.

Given the long-term nature of the Plan, the fact that its stewards are the federal, provincial and territorial governments, and the strong governance and accountability framework of the Plan, it is unlikely that the Plan would become insolvent. Therefore, if the Plan's financial sustainability is to be measured based on its asset excess or shortfall, it should be done so on an open group basis that reflects the partially funded nature of the Plan, that is, its reliance on both future contributions and invested assets as means of financing its future expenditures. The inclusion of future contributions and benefits with respect to both current and future contributors in the assessment of the Plan's financial status shows that the Plan is able to meet its financial obligations and is sustainable over the long term.

Future demographic, economic and financial market environments may differ from those assumed under the best-estimate scenario of the 25th CPP Actuarial Report, and as such may impact the Plan's finances differently. It follows that, regardless of the measure used to assess the Plan's financial status, the unique characteristics of the Plan's long-term obligations and the assets needed to meet those obligations, as well as the relation between them, should all be considered to ensure the long-term financial sustainability of the CPP.

II. Introduction

A. Purpose

This is the tenth actuarial study to be published by the Office of the Chief Actuary (OCA). This study was undertaken in response to Recommendation #4 made by the independent peer review panel that reviewed the 25th Actuarial Report on the Canada Pension Plan as at 31 December 2009[2] (the "25th CPP Actuarial Report"). All the findings of the study are based on the 25th CPP Actuarial Report.

The review panel recommended that only an actuarial balance sheet on an open group basis appear in the actuarial report. They further recommended providing more details and analysis of alternative actuarial balance sheets in an OCA actuarial study. This paper was thus written with the purpose of updating and enhancing Actuarial Study No. 8 "Technical Aspects of the Financing of the Canada Pension Plan", and analyzing the financial sustainability of the CPP using different measures, in particular, assets and liabilities of the Plan under various closed and open group methodologies. One of the objectives of this study was to assess whether discussed measures of the CPP's financial sustainability are consistent with its partial funding approach and take into account both major sources of the financing of the Plan's future expenditures: contributions and invested assets. A more detailed analysis of the balance sheet under the open group methodology including sensitivity analyses based on different demographic, economic, and financial market environments than those assumed under the best-estimate scenario was also performed. Further, methodologies used in assessments of the financial sustainability of the U.S. OASDI program and the Swedish Inkomstpension system were analyzed and applied to measure the financial sustainability of the CPP.

B. Scope

The results contained in this study are based on the "best-estimate" scenario of the 25th CPP Actuarial Report which was tabled before Parliament on 15 November 2010. The best-estimate scenario consists of long-term projections based on "best-estimate" assumptions. These assumptions reflect the best judgement of the Chief Actuary of the CPP as to future demographic, economic, and financial market conditions that will affect the long-term financial sustainability of the Plan. The projections in this study cover periods of 75 years and longer and place more emphasis on long-term historical trends than on short-term trends.

Section III discusses the history of the Plan and how its financing has evolved from pay-as-you-go to steady-state financing. Section IV presents an analysis of the assets and liabilities of the CPP using different balance sheet methodologies. Section V next presents a more in-depth analysis of the balance sheet under the open group methodology, including sensitivity analyses based on different demographic, economic and financial market scenarios. A discussion of financial sustainability measures used for the U.S. OASDI program and the Swedish Inkomstpension system and of their relevance for the CPP is presented in Section VI. The conclusion follows in Section VII. Lastly, three appendices are included in Section VIII that provide, respectively, the principles upon which changes made in 1997 to the Plan (the 1997 Amendments) were based, the references used for the study, and a list of contributors to this study.

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[2] "The Review of the Twenty-Fifth Actuarial Report on the Canada Pension Plan" report by the CPP Actuarial Review Panel and associated documents may be accessed at the following web site: http://www.osfi-bsif.gc.ca/osfi/index_e.aspx?DetailID=377

III. Historical Background on Financing of the CPP

A. Inception to Pre-1997 CPP Amendments

The Canada Pension Plan came into effect on 1 January 1966 as an earnings-related plan to provide working Canadians with retirement, disability, death, survivor and child benefits. The Plan was established primarily to assist with income replacement upon retirement. Retirement benefits under the Plan are meant to replace approximately 25% of a beneficiary's pre-retirement earnings up to $47,360 in 2012 (the five-year average of the Year's Maximum Pensionable Earnings (YMPE)).

The Plan covers employees and self-employed persons between the ages of 18 and 70, but excludes those with earnings less than or equal to the Year's Basic Exemption (YBE), members of certain religious groups, persons who qualify under excepted employment and those covered by the Québec Pension Plan (QPP). The QPP came into effect on the same date as the CPP, and the two plans are deemed to be substantially similar.

Contributions to the Plan are based on contributory earnings between the YBE and the YMPE. In 2012, the YBE and YMPE are $3,500 and $50,100, respectively, giving a maximum contributory earnings base of $46,600. The legislated contribution rate is shared equally between an employer and employee, or applied fully to self-employed persons. In 2012, the combined employer-employee contribution rate is 9.9% (4.95% each), giving a maximum contribution of $4,613.40 ($2,306.70 each). The YBE has been fixed at $3,500 since 1997, whereas the YMPE increases each year in line with the percentage increase, as at 30 June of the preceding year, in the 12-month average of the Industrial Aggregate (the measure of average weekly earnings by Statistics Canada). The CPP is progressive in that contributions are based on earnings above the YBE so that lower-income earners pay a lower level of contributions for the same effective benefit protection.

The CPP was initially established as a pay-as-you-go plan with a small reserve and an initial combined employer-employee contribution rate of 3.6%. The CPP (and QPP) became the second tier of Canada's retirement income system, with the first tier being the Old Age Security Program (including the Guaranteed Income Supplement and Allowance) financed from general tax revenues and the third tier comprising fully funded employer-sponsored registered retirement plans and personal savings, including individual registered retirement savings plans and Tax-Free Saving Accounts. A registered retirement plan is registered with the federal Canada Revenue Agency and thus qualifies for tax sheltering.

At the time of the Plan's inception, demographic and economic conditions were characterized by a younger population owing to higher fertility rates and lower life expectancies, rapid growth in wages and labour force participation, and low rates of return on investments. These conditions made prefunding of the scheme unattractive and a pay-as-you-go scheme more appropriate. Growth in total earnings of the workforce and thus contributions were sufficient to cover growing expenditures without requiring large increases in the contribution rate. The assets of the Plan were invested primarily in long-term non-marketable securities issued by the provincial governments at lower than market rates, thus providing the provinces with a relatively inexpensive source of capital to develop needed infrastructure. However, changing conditions over time, including lower birth rates, increased life expectancies and higher market returns led to increasing Plan costs and made fuller funding more attractive and appropriate. By the mid-1980s, the net cash flows (contributions less expenditures) had turned negative and part of the Plan's investment earnings were required to meet the shortfall. The shortfall continued to grow and eventually caused the

assets to start decreasing by the mid-1990s. The fall in the level of assets resulted in a portion of the reserve being required to cover expenditures.

In the December 1993 (15th) Actuarial Report on the CPP, the Chief Actuary projected that the pay-as-you-go contribution rate (expenditures as a percentage of contributory earnings) would increase to 14.2% by 2030. It was further projected that if changes were not made to the Plan, the reserve fund would be exhausted by 2015. The Chief Actuary identified four factors responsible for the increasing Plan costs, namely: lower birth rates and higher life expectancies than expected, lower productivity, benefit enrichments and increased numbers of Canadians claiming disability benefits for longer periods.

The projected increasing financial burden on workers to financially maintain the Plan led to the federal, provincial, and territorial governments' decision to consult with Canadians in a review of the Plan and to restore its long-term financial sustainability. Following the cross-country consultations held in 1996, the federal, provincial, and territorial governments agreed to amend the Plan based on nine guiding principles (see Appendix A).

The historical financial status of the CPP from its inception to year 2009 is shown in Table 1. The decrease in assets in the mid-1990s is observed in the table. The subsequent increase in the assets starting in the year 1998 resulted from the major changes made to the Plan as agreed in 1997. These Plan amendments are discussed in the following subsection.

Table 1 Historical Financial Status ($ million)[1]

Year	PayGo Rate[2]	Contribution Rate	Contributions[2]	Expenditures	Net Cash Flow	Investment Income[3]	Assets at 31 Dec.[4]	Yield/ Return[4]	Asset/ Expenditure Ratio
	(%)	(%)						(%)	
1966	0.05	3.6	531	8	523	2	525	0.7	52.50
1967	0.06	3.6	623	10	613	37	1,175	4.3	48.96
1968	0.13	3.6	686	24	662	79	1,916	5.1	35.48
1969	0.26	3.6	737	54	683	128	2,727	5.6	28.11
1970	0.45	3.6	773	97	676	193	3,596	6.2	24.13
1971	0.66	3.6	816	149	667	260	4,523	6.5	21.33
1972	0.88	3.6	869	212	657	333	5,513	6.8	19.83
1973	1.07	3.6	939	278	661	404	6,578	6.8	16.78
1974	1.17	3.6	1,203	392	811	498	7,887	7.0	14.06
1975	1.42	3.6	1,426	561	865	607	9,359	7.2	11.47
1976	1.80	3.6	1,630	816	814	747	10,920	7.6	10.48
1977	2.05	3.6	1,828	1,042	786	890	12,596	7.8	9.72
1978	2.31	3.6	2,022	1,296	726	1,043	14,365	7.9	9.03
1979	2.47	3.6	2,317	1,590	727	1,236	16,328	8.3	8.31
1980	2.72	3.6	2,604	1,965	639	1,466	18,433	8.7	7.64
1981	2.89	3.6	3,008	2,413	595	1,784	20,812	9.4	7.04
1982	2.91	3.6	3,665	2,958	707	2,160	23,679	10.0	6.58
1983	3.73	3.6	3,474	3,598	(124)	2,494	26,049	10.4	6.22
1984	3.66	3.6	4,118	4,185	(67)	2,829	28,811	10.7	5.97
1985	4.31	3.6	4,032	4,826	(794)	3,113	31,130	10.8	5.66
1986	4.20	3.6	4,721	5,503	(782)	3,395	33,743	10.9	4.73
1987	5.02	3.8	5,393	7,130	(1,737)	3,654	35,660	10.9	4.31
1988	5.41	4.0	6,113	8,272	(2,159)	3,886	37,387	11.0	3.98
1989	5.89	4.2	6,694	9,391	(2,697)	4,162	38,852	11.3	3.72
1990	5.82	4.4	7,889	10,438	(2,549)	4,386	40,689	11.4	3.53
1991	6.31	4.6	8,396	11,518	(3,122)	4,476	42,043	11.2	3.22
1992	7.07	4.8	8,883	13,076	(4,193)	4,497	42,347	11.0	2.97
1993	7.79	5.0	9,166	14,273	(5,107)	4,480	41,720	10.9	2.72
1994	8.33	5.2	9,585	15,362	(5,777)	4,403	40,346	11.0	2.52
1995	7.91	5.4	10,911	15,986	(5,075)	4,412	39,683	11.3	2.37
1996	8.71	5.6	10,757	16,723	(5,966)	4,177	37,894	11.0	2.16
1997	8.67	6.0	12,165	17,570	(5,405)	3,971	36,460	10.8	1.99
1998	8.11	6.4	14,473	18,338	(3,865)	3,938	36,535	10.9	1.94
1999	8.23	7.0	16,052	18,877	(2,825)	764	42,783	1.7	2.17
2000	7.69	7.8	19,977	19,683	294	4,446	47,523	9.9	2.32
2001	7.85	8.6	22,469	20,515	1,954	3,154	52,631	6.2	2.43
2002	8.16	9.4	24,955	21,666	3,289	187	56,107	0.3	2.47
2003	8.19	9.9	27,454	22,716	4,738	6,769	67,614	11.1	2.84
2004	8.29	9.9	28,459	23,833	4,626	6,475	78,715	8.9	3.15
2005	8.37	9.9	29,539	24,976	4,563	11,083	94,361	13.2	3.59
2006	8.22	9.9	31,657	26,270	5,387	14,433	114,181	14.4	4.11
2007	8.07	9.9	34,051	27,750	6,301	3,267	123,749	2.7	4.23
2008	7.97	9.9	36,318	29,248	7,070	(18,351)	112,468	(14.0)	3.65
2009	8.44	9.9	36,141	30,794	5,347	9,021	126,836	7.6	3.94

(1) Table 1 corresponds to Table 10 in the 25th CPP Actuarial Report.

(2) The pay-as-you-go rates have been calculated using historical contributory earnings, while the contributions are based on estimates made by the Department of Finance.

(3) Investment income includes both realized and unrealized gains and losses.

(4) Results for years 1966 to 1998 are on a cost basis, while results for years 1999 to 2009 are presented on a market value basis. If assets were shown at market value at the end of 1998, total assets would be $44,864 million instead of $36,535 million.

B. 1997 CPP Amendments

Overview – Restoring the Financial Sustainability of the Plan

The changes to restore the financial sustainability of the CPP were legislated in 1997 and became effective on 1 January 1998. The changes involved a balanced approach to sustain the Plan while ensuring fairness for future generations and between males and females. The 1997 changes were based on the principles of increasing the level of funding in order to stabilize the contribution rate, improving intergenerational equity, and securing the financial status of the Plan over the long term. Key changes included steep increases in the contribution rate combined with a freeze on the YBE, a slowing of the future growth of benefits, full funding of any new or improved benefits in the future, and the modification of the investment policy through the creation of the Canada Pension Plan Investment Board (CPPIB). A major change was modifying the financing approach from a pay-as-you-go basis to a hybrid of pay-as-you-go financing and full funding, called "steady-state funding".

Fuller Funding and Changes to Benefits

The schedule of contribution rates since the changes were implemented is shown in Table 2. The results of the 25th CPP Actuarial Report confirm that the contribution rate of 9.9% for years 2010 and thereafter is sufficient to maintain the long-term financial sustainability of the Plan. The combination of a freeze on the YBE at $3,500 and the continued increase in the YMPE has led to the contributory earnings base increasing each year which results in higher Plan contributions and revenue.

Table 2 Schedule of CPP Contribution Rates

Year	Contribution Rate (%)
1997	6.0
1998	6.4
1999	7.0
2000	7.8
2001	8.6
2002	9.4
2003+	9.9

Prior to the changes, retirement, survivor and disability benefits were based on a formula that indexed wages earned over a working lifetime using a final three-year average of the YMPE. This formula was changed to a five-year average, which is the most common way of calculating pension benefits in occupational defined benefit pension plans. There were also other changes that resulted in reducing the future growth of benefits by about 10%.

Changes to the Plan's Financing Provisions

Steady-state funding was introduced to replace pay-as-you-go financing with the purpose of building an asset reserve necessary to stabilize the ratio of assets to expenditures over time. Investment earnings on this pool of assets help to pay benefits as the large cohort of baby boomers retires. Steady-state funding is described in more detail in the next subsection.

Incremental full funding was introduced in order to require that changes to the CPP that improve or add new benefits be fully funded. That is, the costs of these benefits must be paid as the benefit is earned, and any costs associated with benefits that have already been earned must be amortized and paid for over a defined period of time consistent with common actuarial practice. These additional costs may take the form of temporary and/or permanent contribution rate increases. The

steady-state rate is determined independently of the incremental rate. As such, the Plan is financed on a dual basis – the steady-state rate applies only to the basic Plan, whereas the incremental rate applies to new or improved benefits since 1997. The resulting sum of the steady-state and incremental rates is the minimum contribution rate of the Plan.

Both of these funding objectives were introduced to improve fairness and equity across generations, as well as to improve the long-term financial sustainability of the Plan. The move to steady-state funding eases some of the contribution burden on future generations. Under incremental full funding, each generation that will receive benefit enrichments is more likely to pay for it in full so that its costs are not passed onto future generations.

New Investment Policy

It was determined by the review of the CPP in 1996 that to ensure the financial sustainability of the Plan, higher rates of return would be required than had been previously thought. Continuing to invest solely in short-term and low risk fixed income instruments was not considered to be an option since it would ultimately require a higher contribution rate. Hence, the CPP Investment Board was created to invest the assets of the Plan in a diversified portfolio with the aim of achieving higher returns without undue risk of loss. All CPP assets were transferred to the CPPIB by April 2007. The role of the CPPIB will become increasingly important as assets are expected to grow rapidly over the next nine years with contributions to the Plan projected to exceed expenditures over this period. After 2020, a portion of investment earnings will be required to meet expenditures.

Strengthened Stewardship and Accountability

The 1997 Amendments also strengthened stewardship and accountability to Canadians. Specifically, the statutory periodic reviews of the Plan by the federal and provincial finance ministers were increased from once every five years to every three years. Moreover, if a triennial review reveals that major changes are required to be made to the Plan, Canadians are to be informed in advance of any such changes being made. Self-sustaining provisions were also put in place to safeguard the Plan in the event that the minimum contribution rate exceeds the legislated contribution rate and no recommendation is made by the federal and provincial Ministers of Finance either to increase the legislated rate or maintain it.

Further to the changes of 1997, the federal, provincial and territorial finance ministers took additional steps in 1999 to strengthen the transparency and accountability of actuarial reporting on the CPP. They endorsed regular independent peer reviews of such reports and consultations by the Chief Actuary with experts on the assumptions to be used in the actuarial reports. The most recent independent review of the statutory actuarial report on the CPP confirmed that the work of the Chief Actuary meets professional standards of actuarial practice and is of sound quality. To ensure the quality of future actuarial reports, the Chief Actuary continues to consult with experts in the fields of long-term demographic and economic projections.

In summary, the 1997 Amendments resulted in the financial sustainability of the Plan being restored and maintained as confirmed in subsequent actuarial reports. The measures implemented ensure strengthened stewardship, accountability and transparency regarding the Plan and its finances.[3]

[3] For further historical background on the 1997 Amendments, the reader may refer to "Fixing the Future: How Canada's Usually Fractious Governments Worked Together to Rescue the Canada Pension Plan" by Bruce Little.

C. Steady-State Funding of the CPP

Steady-state funding is a partial funding approach that is a hybrid of pay-as-you-go financing and full funding, where the level of prefunding depends on the best-estimate assumptions. Steady-state funding was introduced as part of the 1997 CPP Amendments in order to build a greater reserve of assets and stabilize the ratio of assets to expenditures over time.

The steady-state methodology results in a stable contribution rate over the long term and helps to improve intergenerational equity. When the CPP financing methodology was examined in 1997, intergenerational equity was one of the primary concerns. Maintaining a pure pay-as-you-go approach would have resulted in significant increases in the contribution rate over time to provide the same benefits. On the other hand, moving to full funding approach would have also created unfairness across generations, as some generations would have been required to pay higher contributions than others to cover both their own past unfunded liability as well as the past unfunded liability of current retirees. Financing of the CPP moved from a pay-as-you-go approach to partial funding in order to build a much larger fund than the one before the amendments. The partial funding approach provides a balance between pay-as-you-go and full funding and contributes to diversifying of the financing of Canada's retirement income system. This diversification of financing approaches, in turn, strengthens the system against possible fluctuations in demographic, economic, and financial market conditions.

Steady-state funding involves a steady-state contribution rate that is the lowest rate sufficient to ensure the long-term financial sustainability of the Plan without recourse to further rate increases. This rate is calculated by the Chief Actuary based on regulations set out in legislation and is part of each triennial actuarial valuation of the Plan that is made public. The steady-state contribution rate ensures the stabilization of the A/E ratio over time, before the consideration of any full funding of improved or new benefits. Specifically, Regulations of the *Canada Pension Plan* require that the steady-state contribution rate be the lowest rate such that the A/E ratios in the 10th and 60th year following the 3rd year of the most recent review period are the same.

At the time of the 1997 Amendments, the steady-state contribution rate was determined to be 9.9% for the year 2003 and thereafter as shown in the September 1997 (16th) Actuarial Report on the CPP. The contribution rate was thus scheduled to increase incrementally from 5.6% in 1996 to 9.9% in 2003 and to remain at that level thereafter. The legislated rate has remained at 9.9% in accordance with the schedule. In subsequent actuarial reports on the Plan the steady-state contribution rate and more recent minimum contribution rate have been determined to be below 9.9%. Under the 25th CPP Actuarial Report, the steady-state contribution rate was determined to be 9.84% and the minimum contribution rate to be 9.85%. Under this report, with the legislated rate of 9.9%, the A/E ratio is expected to grow to 4.7 by 2020 and 5.2 by 2050.

Table 3 shows the projected financial status of the CPP using the legislated contribution rate of 9.9%.

Table 3 Projected Financial Status[1] ($ million)

Year	PayGo Rate	Contribution Rate	Contributory Earnings	Contributions	Expenditures	Net Cash Flow	Investment Income[2]	Assets at 31 Dec.	Yield	Asset/ Expenditure Ratio
	(%)	(%)							(%)	
2010	8.65	9.90	372,340	36,862	32,192	4,670	2,391	133,897	1.80	3.94
2011	8.80	9.90	386,384	38,252	33,992	4,260	7,268	145,425	5.20	4.04
2012	8.87	9.90	406,151	40,209	36,016	4,193	8,438	158,056	5.58	4.13
2013	9.06	9.90	422,153	41,793	38,255	3,538	9,112	170,705	5.56	4.21
2014	9.24	9.90	438,529	43,414	40,518	2,896	9,862	183,464	5.59	4.29
2015	9.40	9.90	455,598	45,104	42,809	2,295	11,571	197,330	6.12	4.37
2016	9.51	9.90	474,216	46,947	45,113	1,834	12,367	211,532	6.10	4.46
2017	9.60	9.90	494,453	48,951	47,456	1,495	13,225	226,251	6.09	4.53
2018	9.67	9.90	516,668	51,150	49,961	1,189	14,341	241,781	6.18	4.59
2019	9.75	9.90	540,315	53,491	52,671	820	15,476	258,077	6.25	4.64
2020	9.83	9.90	565,486	55,983	55,608	375	16,646	275,099	6.31	4.68
2021	9.93	9.90	591,677	58,576	58,733	(157)	17,753	292,695	6.32	4.72
2022	10.05	9.90	616,844	61,068	62,014	(946)	18,857	310,605	6.32	4.74
2023	10.19	9.90	642,678	63,625	65,461	(1,836)	19,975	328,744	6.32	4.76
2024	10.31	9.90	669,652	66,296	69,062	(2,766)	21,093	347,070	6.31	4.77
2025	10.43	9.90	697,860	69,088	72,782	(3,694)	22,303	365,680	6.33	4.77
2026	10.54	9.90	727,080	71,981	76,599	(4,618)	23,504	384,566	6.34	4.78
2027	10.61	9.90	758,553	75,097	80,497	(5,400)	24,704	403,869	6.34	4.78
2028	10.68	9.90	791,300	78,339	84,492	(6,153)	25,924	423,640	6.34	4.78
2029	10.74	9.90	824,784	81,654	88,601	(6,947)	27,160	443,853	6.34	4.78
2030	10.78	9.90	860,535	85,193	92,803	(7,610)	28,444	464,687	6.34	4.79
2031	10.82	9.90	897,069	88,810	97,085	(8,275)	29,764	486,176	6.34	4.79
2032	10.84	9.90	935,825	92,647	101,438	(8,791)	31,129	508,514	6.33	4.80
2033	10.84	9.90	976,463	96,670	105,876	(9,206)	32,554	531,861	6.33	4.82
2034	10.84	9.90	1,018,855	100,867	110,430	(9,563)	34,035	556,333	6.33	4.83
2035	10.83	9.90	1,063,407	105,277	115,130	(9,853)	35,542	582,023	6.32	4.85
2036	10.81	9.90	1,109,723	109,863	119,997	(10,134)	37,170	609,058	6.32	4.87
2037	10.80	9.90	1,158,133	114,655	125,031	(10,376)	38,891	637,573	6.32	4.90
2038	10.77	9.90	1,208,981	119,689	130,231	(10,542)	40,701	667,732	6.31	4.92
2039	10.75	9.90	1,261,488	124,887	135,631	(10,744)	42,634	699,622	6.31	4.95
2040	10.73	9.90	1,315,993	130,283	141,263	(10,980)	44,686	733,329	6.31	4.98
2045	10.75	9.90	1,617,807	160,163	173,945	(13,782)	56,742	929,721	6.33	5.12
2050	10.94	9.90	1,973,718	195,398	215,909	(20,511)	71,427	1,169,230	6.33	5.18
2055	11.15	9.90	2,403,391	237,936	267,882	(29,946)	88,477	1,446,259	6.33	5.18
2060	11.22	9.90	2,937,762	290,838	329,666	(38,828)	108,321	1,769,492	6.33	5.15
2065	11.17	9.90	3,608,577	357,249	403,101	(45,852)	132,554	2,166,125	6.33	5.16
2070	11.12	9.90	4,436,956	439,259	493,461	(54,202)	162,997	2,664,808	6.33	5.18
2075	11.17	9.90	5,435,534	538,118	606,938	(68,820)	200,536	3,277,586	6.33	5.18
2080	11.28	9.90	6,634,126	656,778	748,226	(91,448)	245,115	4,002,277	6.33	5.13
2085	11.40	9.90	8,087,024	800,615	921,603	(120,988)	296,556	4,835,939	6.33	5.03

(1) Table 3 corresponds to Table 11 in the 25th CPP Actuarial Report.
(2) Investment income includes both realized and unrealized gains and losses.

IV. Analysis of Assets and Liabilities of the CPP

This section presents an analysis and comparison of the assets and obligations (liabilities) of the Plan under different closed and open group methodologies. Two measures of the Plan's financial status are analyzed for each methodology: the difference between the Plan's assets and its liabilities (this difference is termed "asset excess", if positive, or "asset shortfall", if negative) and the total Plan's assets as a percentage of its liabilities. Both measures provide an indication of the extent to which the Plan's obligations are covered by its assets.

A. General Methodology

A closed group includes only current participants of a plan, with no new entrants permitted. In comparison, an open group is one that includes all current and future participants of a plan. Two types of closed groups are discussed in this section: a closed group without future benefit accruals for the group's members, and a closed group with future accruals for its members. The closed group without future benefits accruals methodology has historically been used in the CPP actuarial reports to value the Plan's liabilities. Following the publication of Actuarial Study No. 8, the Plan's balance sheet based on an open group methodology was also included in the 25th CPP Actuarial Report.

The choice of the methodology used to produce a social security pension system's balance sheet is mainly determined by the system's financing approach. For fully funded systems, the accrued liabilities are assumed to be funded in advance. Therefore balance sheets under closed groups with or without future accruals are appropriate for such plans. On the other hand, pay-as-you-go and partially funded systems represent social contracts where, in any given year, current contributors allow the use of their contributions to pay current beneficiaries' benefits. As a result, such social contracts create a claim for current and past contributors to contributions of future contributors. The proper assessment of the financial sustainability of a social security pay-as-you-go or partially funded system by means of its balance sheet should take these claims into account. The traditional closed group methodologies do not reflect these claims since only current participants are considered. In comparison, the open group approach accounts explicitly for these claims by considering the benefits and contributions of both current and future plan participants. Closed group and open group methodologies for the CPP are discussed in this section. An alternative methodology developed in Sweden with respect to measuring assets for closed group balance sheet for pay-as-you-go and partially funded systems is discussed in Section VI.

For all balance sheets discussed in this section, it is assumed that future contributions are determined using the legislated contribution rate of 9.9%. It is also assumed that the assets of the Plan are invested in the best-estimate portfolio of the 25th CPP Actuarial Report and consist ultimately of 42% invested in equity, 40% in fixed income securities, and 18%in inflation-sensitive assets, such as real estate and infrastructure. The ultimate annual real and nominal returns on this portfolio are assumed to be 4.0% and 6.3%, respectively. For the purpose of determining actuarial liabilities and assets, the future cash flows are discounted using the assumed nominal rate of return on the CPP assets. It could be argued, that such a discount rate is not appropriate for determining the Plan's liabilities and assets since the CPP is a partially funded plan largely financed by future contributions. The study addresses the use of alternative discount rates based on the growth in the contributory base for both open and closed group approaches in Sections V and VI, respectively.

Another important element of the methodology used to determine the components of the CPP balance sheets is the length of the projection period. Subsection 115(1.1) of the *Canada Pension Plan* specifies that the CPP actuarial report should present financial information for at least a

75-year period following the valuation date. For a closed group with or without future accruals, the projection of future contributions and expenditures for a 75-year period is sufficient to cover all future contributions and expenditures associated with the group's participants. On the other hand, the use of a 75-year projection period for the open group balance sheet could be viewed as insufficient. For example, a 75-year period was historically used to determine the long-term financial sustainability of the Old-Age, Survivors, and Disability Insurance (OASDI) program in the United States. However, the 2010 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds (the 2010 Trustees Report) states that "the overemphasis on summary measures (such as the actuarial balance and open group unfunded obligation[4]) for the 75-year period can lead to incorrect perceptions and policies that fail to address financial sustainability for the more distant future". In this study, unless otherwise specified, the projected cash flows over an extended time period of 150 years are used. It should be noted that, while enhancing the assessment of the financial sustainability of the Plan, increasing the length of the projection period also increases the uncertainty of results. Section VI discusses the financial sustainability of the CPP under the open group using a 75-year period and compares it to the OASDI program.

B. Closed Group Without Future Accruals

For this group, no new entrants to the Plan are permitted, and current plan participants who are not receiving benefits at the valuation date are assumed to make no further contributions beyond that date, and hence accrue no future benefits.

To determine the actuarial liability under the closed group approach, the benefits that will be paid in respect of CPP participation up to and including the valuation date must first be projected. For beneficiaries in pay, expenditures are projected using the best-estimate assumptions of the 25th CPP Actuarial Report with benefits increased annually in line with inflation as provided under the current Plan. For contributors, the projection is also based on the best-estimate assumptions of the Plan with the following exceptions:

- No new entrants to the Plan are included; and
- Current Plan participants who are not receiving benefits at the valuation date are assumed to make no further contributions beyond that date. Their projected benefits are calculated by assuming they will have no pensionable earnings from the valuation date up to the year of benefit take-up. In accordance with the Plan's provisions, the YMPE is still projected to the year of benefit take-up, and pre-valuation date pensionable earnings are still indexed to the year of benefit take-up using projected nominal wage increases, i.e. changes in the Consumer Price Index (CPI) plus real wage increases.

The maximum contributory period for each Plan participant is 47 years; that is, from age 18 to 65. Some periods of low pensionable earnings may be excluded from the benefit calculation by reason of pensions commencing after age 65, disability, child-rearing for a child less than seven years of age, and the low-earnings drop-out provision.

The low-earnings drop-out provision allows for a number of years with low or zero earnings to be dropped from the calculation of the retirement benefit. For example, for someone who takes his or her retirement benefit at age 65 and before 2014, the provision allows for 16% of the number of

[4] The term "unfunded obligation" refers to the difference between plan's obligations and assets, i.e. this is a value opposite of the asset excess or shortfall.

months with the lowest earnings (up to a maximum of about seven and half years) to be dropped from the calculation of the benefit. The low-earnings drop-out provision was 15% prior to 1 January 012, and is set to increase to 17% on 1 January 2014.

For the purpose of determining the projected benefits, the low-earnings drop-out provision is applied to the period up to the valuation date. Thus, if a member has been eligible to contribute for a period of 30 years prior to the valuation date, only 16% of those years (5, in this example) will be dropped and the maximum contributory period will be 42 years (assuming no other drop-outs apply).

A participant's retirement pension is equal to 25% of the average of the YMPE for the year of his or her retirement and the four previous years, referred to as the Maximum Pensionable Earnings Average (MPEA), adjusted to take into account the contributor's pensionable earnings. For this purpose, the contributor's pensionable earnings for any given month are indexed by the ratio of the MPEA for the year of retirement to the YMPE for the year to which the given month belongs. It follows that if a contributor paid contributions on earnings equal to the YMPE for thirty years, his average adjusted earnings would be determined by multiplying his MPEA by the ratio of 30/42.

The resulting projected expenditures are next discounted using the expected rate of return on the overall CPP assets to determine their present value. This is the actuarial liability of the Plan under the closed group without future benefit accruals approach. The assets under this approach consist of the Plan's current assets.

Under this approach, as at 31 December 2009, the Plan's asset shortfall is $748 billion and the total assets represents 14.5% of the actuarial liabilities, as shown in Table 4.

As a result of the 1997 CPP amendments, the Plan has been moving away from pure pay-as-you-go financing (with a small contingency reserve) towards partial funding. However, it should be noted that full funding of the Plan was never intended by the stakeholders. Although the relative size of the asset excess or shortfall under the closed group may be used as a measure of the Plan's financial status, the balance sheet under the closed group methodology does not reflect the nature of the partial financing approach where future contributions represent a major source of financing of future expenditures. Therefore, it is inappropriate to reach a conclusion regarding the Plan's financial sustainability considering only the asset shortfall or excess of the closed group balance sheet.

C. Closed Group With Future Accruals

For this group, no new entrants to the Plan are permitted, and current Plan participants who are not receiving benefits at the valuation date are assumed to continue contributing to the Plan beyond that date. Thus, current Plan participants also continue to accrue benefits with future salary increases in line with wage increases. As a result, the obligations side of the balance sheet includes the present value of future expenditures for current Plan participants, while the assets side includes the present value of their future contributions. The asset shortfall under this methodology as at 31 December 2009 is $509 billion. The balance sheet for the CPP using this alternative methodology is presented in Table 4 together, for comparison, with the closed group without future accruals methodology and the open group methodology, discussed next.

D. Open Group

An open group is defined as one that includes all current and future participants of a plan, where the plan is considered to be ongoing into the future, that is, over an extended time horizon. This means that future contributions of current and new participants and their associated benefits are included in order to determine whether current assets and future contributions will be sufficient to pay for all future expenditures.

To determine the actuarial liability of the Plan under the open group approach, future expenditures with respect to current and future Plan participants are first projected using the best-estimate assumptions of the 25th CPP Actuarial Report. Next, these total projected expenditures are discounted using the expected nominal rate of return on CPP assets to determine their present value. This is the actuarial liability under the open group approach.

To determine the assets of the Plan under the open group approach, future contributions of current and future contributors are projected using the best-estimate assumptions of the 25th CPP Actuarial Report and the legislated rate of 9.9%. These total projected contributions are then discounted using the expected nominal rate of return on current CPP assets to determine their present value. This present value is added to the Plan's current assets to obtain the total assets of the Plan.

The asset shortfall under the open group methodology as at 31 December 2009 is $7 billion and the total assets covers 99.7% of the actuarial liabilities. As mentioned earlier, the future cash flows are discounted using the expected nominal rate of return on the assets which are assumed to be invested in the best-estimate portfolio of the 25th CPP Actuarial Report. In addition, future contributions are calculated using the current legislated contribution rate of 9.9%.

If the Plan's financial sustainability is to be measured based on its asset excess or shortfall, it should be done on an open group basis. The independent peer review panel concurred with the statement in the 25th CPP Actuarial Report: "The Plan is intended to be long-term and enduring in nature, a fact that is reinforced by the federal, provincial and territorial governments' stewardship through the established strong governance and accountability framework of the Plan. Thus, an open group valuation that emphasizes the long-term nature of the Plan could be deemed to be the most appropriate." The inclusion of future contributions and benefits with respect to both current and future participants in the assessment of the Plan's financial status confirms that the Plan is able to meet its financial obligations and is sustainable over the long term.

Table 4 Balance Sheet as at 31 December 2009 for the CPP: Groups With and Without Future Benefit Accruals – Comparison of Methodologies
(9.9% contribution rate)

	Methodology		
	Excluding Future Benefit Accruals	Including Future Benefit Accruals	
Present Value as at 31 December (in $ billion)	Closed Group	Closed Group	Open Group
Assets			
Current Assets	127	127	127
Future Contributions	-	699	1,861
Total Assets (a)	127	826	1,988
Liabilities[1]			
Current Benefits	308	308	308
Future Benefits	567	1,027	1,687
Total Liabilities (b)	875	1,335	1,995
Asset Excess (Shortfall) (a) – (b)	(748)	(509)	(7)
Total Assets as a Percentage of Total Liabilities (%) (a)/(b)	14.5%	61.9%	99.7%

(1) Liabilities include administrative expenses.

Compared to the closed group with accruals and the open group, the asset shortfall for the closed group without accruals is larger, as shown in Table 4. This is because there are no future contributions to the Plan as well as no future accruals. Under the best-estimate assumptions, the present value of future contributions exceeds the present value of the associated future benefits, and, as a result, the asset shortfall decreases for the groups with accruals compared to group without future accruals. However, a substantial shortfall exists under the closed groups (with or without accruals), since these approaches do not fully account for future contributions as a major source of financing of the Plan.

E. Summary of Assets and Liabilities of the CPP

The following Table 5 summarizes the assets, liabilities and the resulting asset excess or shortfalls of current and future Plan participants as at 31 December 2009 and 2019 for the three types of groups under the best-estimate assumptions of the 25th CPP Actuarial Report, the legislated contribution rate of 9.9%, and an expected real rate of return of 4.0% (6.3% the nominal).

Table 5 Balance Sheet Summary as at 31 December 2009 and 2019 for the CPP: Groups With and Without Future Benefit Accruals
(9.9% contribution rate)

Present Value as at 31 December (in $ billion)[1]	2009	2019
Closed Group Without Future Accruals		
Assets		
Current Assets	127	258
Future Contributions	-	-
Total Assets (a)	127	258
Liabilities		
Current Benefits	308	533
Future Benefits	567	776
Total Liabilities (b)	875	1,309
Asset Excess (Shortfall) (c) = (a) – (b)	**(748)**	**(1,051)**
Total Assets as Percentage of Liabilities (a)/(b)	**14.5%**	**19.7%**
Closed Group With Future Accruals		
Assets		
Current Assets	127	258
Future Contributions	699	981
Total Assets (d)	826	1,239
Liabilities		
Current Benefits	308	533
Future Benefits	1,027	1,427
Total Liabilities (e)	1,335	1,960
Asset Excess (Shortfall) (f) = (d) – (e)	**(509)**	**(721)**
Change in Asset Excess or Shortfall (f) – (c)	239	330
Total Assets as Percentage of Liabilities (d)/(e)	**61.9%**	**63.2%**
Open Group		
Assets		
Current Assets	127	258
Future Contributions	1,861	2,567
Total Assets (g)	1,988	2,825
Liabilities		
Current Benefits	308	533
Future Benefits	1,687	2,304
Total Liabilities (h)	1,995	2,837
Asset Excess (Shortfall) (i) = (g) – (h)	**(7)**	**(12)**
Change in Asset Excess or Shortfall (i) – (f)	502	709
Total Assets as Percentage of Liabilities (g)/(h)	**99.7%**	**99.6%**

(1) Liabilities include administrative expenses.

Table 5 shows that for the closed group without future accruals, the asset shortfall increases from $748 billion to $1,051 billion between 2009 and 2019. Despite the growth in the asset shortfall, the ratio of assets to obligations increases from 15% to 20% over the same period. Net cash flows to the Plan are expected to continue to be positive up to and including the year 2020. In addition, expected investment returns are 4.0% above inflation. Thus, positive net cash flows and investment returns result in the Plan's assets growing at a faster rate than its liabilities, which improves the ratio of the assets to liability.

The closed group with future accruals includes the future contributions and expenditures for current contributors in the calculation of the assets and liabilities. Under the best-estimate assumptions, the present value of future contributions exceed the associated present value of future benefits earned, and as a result the asset shortfall decreases compared to the closed group without future accruals. Between 2009 and 2019, the asset shortfall for the closed group with future accruals increases from $509 billion to $721 billion. The ratio of the assets to liabilities is stable at around 62% in both years.

The open group includes future contributions and expenditures for both current and future participants in the calculation of the assets and liabilities. Thus, the asset shortfall decreases compared to both closed groups. Between 2009 and 2019, the asset shortfall increases slightly from $7 billion to $12 billion, and the ratio of the assets to liabilities remains stable at over 99%. The inclusion of the future contributions and benefits of current and future Plan participants demonstrates that the Plan is financially sustainable over the long term. The future contributions under the legislated contribution rate of 9.9% of contributory earnings in combination with investment earnings are sufficient to pay the future expenditures and build a larger fund. In turn, this larger fund provides additional capacity for mitigating the impact on the Plan's finances from future adverse demographic and economic environments.

V. Open Group Modified Balance Sheet

A. Best-Estimate Scenario

In this section the open group balance sheet is presented in a modified form, such that the pay-as-you-go and funded components of the Plan are shown separately in order to analyze the assets and liabilities under each component. This modified balance sheet is first discussed under the best-estimate scenario of the 25th CPP Actuarial Report. Next, the modified balance sheet is discussed under alternative discount rate assumptions that take into account the largely pay-as-you-go nature of the Plan.

As discussed in Section III, the CPP is financed using a steady-state contribution rate methodology that stabilizes the asset/expenditure ratio over time. This approach to financing the Plan is a form of partial funding, that is, a hybrid of pay-as-you-go financing and full funding. This hybrid nature of partial funding allows for part of a current year's expenditures to be financed from the same year's contributions, stemming from the pay-as-you-go component of the Plan. The remaining expenditures, if any, are covered using the underlying pension fund from the funded component of the Plan. Although there is a funded component to steady-state funding, its goal is not to fully fund the Plan. Rather, by stabilizing the asset/expenditure ratio, steady-state funding ensures that the Plan's contributions remain the primary source for covering the Plan's expenditures.

Table 6 presents the splitting of the projected contributions and expenditures into the pay-as-you-go and the funded components of the CPP under the best-estimate scenario and the legislated 9.9% contribution rate. By definition, under the pay-as-you-go component, the contributions and expenditures are exactly equal every year. Contributions for the funded component exist as long as the current year's contributions exceed the same year's expenditures. These excess contributions are added to the Plan's assets, which are invested by the CPPIB. The 25th CPP Actuarial Report projects that contributions will exceed expenditures up to and including the year 2020. Starting in 2021, the expenditures are then projected to be higher than contributions. These excess expenditures are allocated to the funded component of the Plan, and are financed by the invested assets.

Table 6 Splitting of CPP Contributions and Expenditures into Pay-As-You-Go and Funded Components (9.9% contribution rate, $ billion)

	Pay-As-You-Go Component		Funded Component		Total[1]	
	Contributions (a)	Expenditures (b)	Contributions (c)	Expenditures (d)	Contributions (a) + (c)	Expenditures (b) + (d)
2010	32.2	32.2	4.7	0.0	36.9	32.2
2011	34.0	34.0	4.3	0.0	38.3	34.0
2012	36.0	36.0	4.2	0.0	40.2	36.0
2013	38.3	38.3	3.5	0.0	41.8	38.3
2014	40.5	40.5	2.9	0.0	43.4	40.5
2015	42.8	42.8	2.3	0.0	45.1	42.8
2016	45.1	45.1	1.8	0.0	46.9	45.1
2017	47.5	47.5	1.5	0.0	49.0	47.5
2018	50.0	50.0	1.2	0.0	51.2	50.0
2019	52.7	52.7	0.8	0.0	53.5	52.7
2020	55.6	55.6	0.4	0.0	56.0	55.6
2021	58.6	58.6	0.0	0.2	58.6	58.7
2022	61.1	61.1	0.0	0.9	61.1	62.0
2023	63.6	63.6	0.0	1.8	63.6	65.5
2024	66.3	66.3	0.0	2.8	66.3	69.1
2025	69.1	69.1	0.0	3.7	69.1	72.8
2026	72.0	72.0	0.0	4.6	72.0	76.6
2027	75.1	75.1	0.0	5.4	75.1	80.5
2028	78.3	78.3	0.0	6.2	78.3	84.5
2029	81.7	81.7	0.0	6.9	81.7	88.6
2030	85.2	85.2	0.0	7.6	85.2	92.8
2031	88.8	88.8	0.0	8.3	88.8	97.1
2032	92.6	92.6	0.0	8.8	92.6	101.4
2033	96.7	96.7	0.0	9.2	96.7	105.9
2034	100.9	100.9	0.0	9.6	100.9	110.4
2035	105.3	105.3	0.0	9.9	105.3	115.1
2036	109.9	109.9	0.0	10.1	109.9	120.0
2037	114.7	114.7	0.0	10.4	114.7	125.0
2038	119.7	119.7	0.0	10.5	119.7	130.2
2039	124.9	124.9	0.0	10.7	124.9	135.6
2040	130.3	130.3	0.0	11.0	130.3	141.3
2045	160.2	160.2	0.0	13.8	160.2	173.9
2050	195.4	195.4	0.0	20.5	195.4	215.9
2055	237.9	237.9	0.0	29.9	237.9	267.9
2060	290.8	290.8	0.0	38.8	290.8	329.7
2065	357.2	357.2	0.0	45.9	357.2	403.1
2070	439.3	439.3	0.0	54.2	439.3	493.5
2075	538.1	538.1	0.0	68.8	538.1	606.9
2080	656.8	656.8	0.0	91.4	656.8	748.2
2085	800.6	800.6	0.0	121.0	800.6	921.6

(1) As shown in Table 3 of subsection III.C.

The open group balance sheet shown in Table 4 of Section IV can be regrouped in a way that emphasizes the hybrid nature of partial funding and allows for a better understanding of how future expenditures are financed. As a first step, the assets and liabilities sides of the balance sheet are modified as follows:

- On the assets side, the present value of future contributions is broken down into the present value of future contributions that cover future expenditures (pay-as-you-go component future contributions shown in column (a) of Table 6) and the present value of future contributions in excess of future expenditures, which are invested (funded component future contributions shown in column (c) of Table 6);
- On the liabilities side of the balance sheet, the present value of future expenditures is similarly broken down into the present value of future expenditures covered by future contributions (pay-as-you-go component future expenditures shown in column (b) of Table 6) and the present value of future expenditures not covered by future contributions and therefore financed by the invested assets (funded component future expenditures shown in column (d) of Table 6).

Then, as the second step, the open group balance sheet is regrouped by separating it into its two components: pay-as-you-go and funded. Charts 1 and 2 illustrate the two steps to construct the open group modified balance sheet.

Chart 1 Open Group Modified Balance Sheet Approach – Step 1
(as at 31 December 2009, 9.9% contribution rate, $ billion)

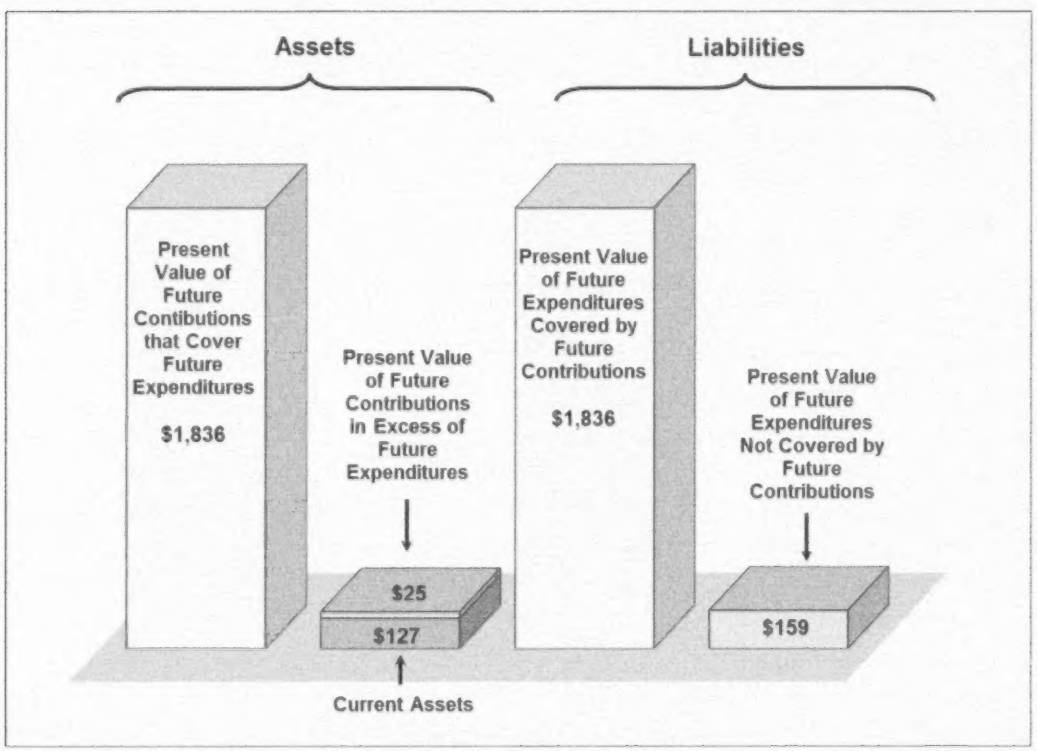


Chart 2 Open Group Modified Balance Sheet Approach – Step 2
(as at 31 December 2009, 9.9% contribution rate, $ billion)

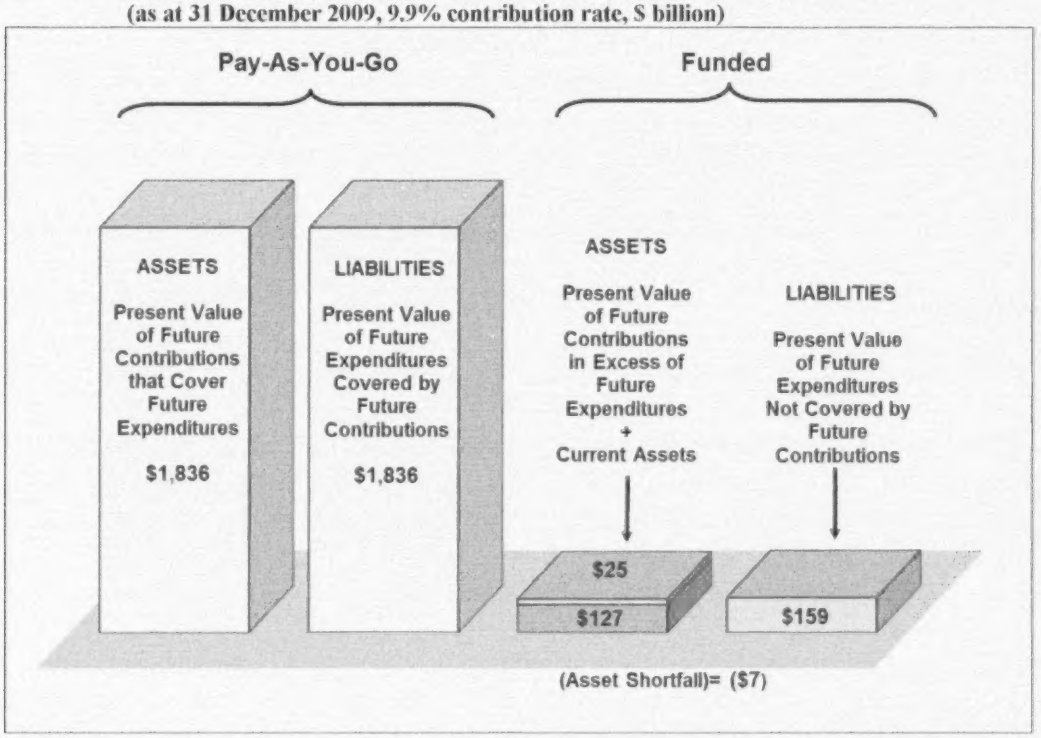


Chart 2 clearly shows that no asset excess or shortfall exists with respect to the pay-as-you-go component. Under pay-as-you-go financing, while both the present values of the assets and liabilities could vary depending on past experience and future actuarial assumptions, they will always remain equal. Under the funded component, an asset shortfall results when the total assets, consisting of the invested assets and the present value of future contributions in excess of future expenditures, are not sufficient to pay the future expenditures not covered by future contributions. In the case of the open group under the best-estimate scenario, the asset shortfall is $7 billion.

The financial status of the funded component and its evolution over time provide meaningful measures of the financial status of the CPP. In addition, the relative sizes of the pay-as-you-go and funded obligations may be regarded as measures of the degree to which the Plan is funded. The open group modified balance sheet for years 2009 and 2019 is next shown in Table 7.

The funded component's total assets fall short of its obligations by $7 billion as at 31 December 2009. By 2019, the present value of future contributions in excess of future expenditures under the funded component becomes very small since contributions are projected to exceed expenditures for only one more year. The value of the Plan's assets increases to $258 billion and the asset shortfall rises further to $12 billion. However, the ratio of the total assets to total obligations remains in excess of 99%. The open group methodology confirms that the Plan is financially sustainable over the long term.

The decomposition of the Plan into the pay-as-you-go and funded components provides additional insight into the nature of the risks to which the CPP is exposed. Both the pay-as-you-go and funded components are subject to demographic and economic risks. The pay-as-you-go component, however, is not exposed to financial market risk since the associated cash flows are

not invested. This is in contrast to the funded component, which is subject to financial market risk since its assets are invested. As such, it is important for this additional risk to the funded component of the Plan, and hence to the Plan as a whole, to be taken into account in considering both the short-term and long-term financial sustainability of the Plan. Moreover, this consideration will become increasingly important since the share of the funded component's obligations as a percentage of the total CPP obligations are expected to increase over time. The funded component's share of the obligations was 8% as at the end of 2009, and is projected to increase to 10% by 2019 and to 15% by 2085.

Table 7 Open Group Modified Balance Sheet – Best-Estimate Scenario
(9.9% contribution rate)

Present Value (PV) as at 31 December (in $ billion) [1]	2009	2019
Pay-As-You-Go Component		
Assets = Liabilities		
PV of Future Contributions that Cover Future Expenditures = PV of Future Expenditures Covered by Future Contributions **(a)**	1,836	2,566
No asset excess (shortfall) exists for pay-as-you-go component.		
Funded Component		
Assets		
PV of Future Contributions in Excess of Future Expenditures	25	1
Current Assets	127	258
Total Assets for funded component **(b)**	152	259
Liabilities		
PV of Future Expenditures Not Covered by Future Contributions **(c)**	159	271
Asset excess (shortfall) with respect to funded component **(d) = (b) – (c)**	(7)	(12)
Total Plan		
Total Assets (e) = (a) + (b)	1,988	2,825
Total Liabilities (f) = (a) + (c)	1,995	2,837
Total Asset Excess (Shortfall) (g) = (e) – (f)	(7)	(12)
Total Assets as a Percentage of Total Liabilities (h) = (e)/(f)	99.7%	99.6%
Component liabilities as a percentage of total liabilities:		
Pay-As-You-Go (a)/(f)	**92%**	**90%**
Funded (c)/(f)	**8%**	**10%**

(1) Liabilities include administrative expenses.

The present values in Table 7 were determined using a discount rate equal to the expected nominal rate of return on the CPP assets. This methodology is similar to the one used for the Trustees Report on the OASDI program in the United States, where the open group balance sheet entries are determined by discounting the program's future contributions and expenditures using the effective yield on the trust fund assets. However, the cash flows of the pay-as-you-go component are not invested and depend on the demographic and economic factors other than market returns. Therefore, it could be argued that the use of the expected return on the CPP assets as a discount rate for the pay-as-you-go component may not be appropriate.

It is desirable for a discount rate used to determine the present values of future cash flows of a pension system to reflect growth in the system's financing base. For a pure pay-as-you-go system that is financed by contributions only, such a discount rate should be equal to the growth in the contributory base, as suggested by Settergren and Mikula (2005). The financing base of a pay-as-you-go system with a fund, such as the CPP, has two components: future contributions (contributory base) and invested assets of the system. As such, discounting the cash flows of the

pay-as-you-go component using the growth in the contributory base and discounting the cash flows of the funded component using the expected return on the CPP assets represent a natural choice.

The nominal growth in the contributory base consists of three components: growth in the real-wage differential, inflation and growth in the number of contributors. Based on the best-estimate assumptions of the 25th CPP Actuarial Report, the ultimate nominal growth in the contributory base is 4.1%, or 1.8% in real terms. Table 8 compares a modified open group balance sheet as at 31 December 2009 with the pay-as-you-go component's cash flows discounted using the growth in the contributory base and the expected rate of return on the CPP assets. The funded component's cash flows are discounted using the rate of return on the invested CPP assets (ultimate real rate of return of 4.0% or nominal rate of return of 6.3%) under both scenarios.

Table 8 Open Group Modified Balance Sheet – Alternative Discount Rates
Discount Rates for Pay-As-You-Go Component: Growth in Contributory Base and Expected Rate of Return on CPP Assets
Discount Rate for Funded Component: Expected Rate of Return on CPP Assets
(9.9% contribution rate)

	Discount Rate for Pay-As-You-Go Component	
Present Value (PV) as at 31 December 2009 (in $ billion) [1]	**Growth in Contributory Base (4.1%)**	**Rate of Return on the CPP Assets (6.3%)**
Pay-As-You-Go Component		
Assets = Liabilities		
PV of Future Contributions that Cover Future Expenditures = PV of Future Expenditures Covered by Future Contributions (a)	5,573	1,836
No asset excess (shortfall) exists for pay-as-you-go component.		
Funded Component[2]		
Assets		
PV of Future Contributions in Excess of Future Expenditures	25	25
Current Assets	127	127
Total Assets for funded component (b)	152	152
Liabilities		
PV of Future Expenditures Not Covered by Future Contributions (c)	159	159
Asset excess (shortfall) with respect to funded component (d) = (b) – (c)	(7)	(7)
Total Plan		
Total Assets (e) = (a) + (b)	5,725	1,988
Total Liabilities (f) = (a) + (c)	5,732	1,995
Total Asset Excess (Shortfall) (g) = (e) – (f)	(7)	(7)
Total Assets as a Percentage of Total Liabilities (h) = (e)/(f)	99.9%	99.7%
Component liabilities as a percentage of total liabilities:		
Pay-As-You-Go (a)/(f)	**97%**	**92%**
Funded (c)/(f)	**3%**	**8%**

(1) Liabilities include administrative expenses.
(2) Discounted at the rate of return on the CPP assets.

Since the rate of growth in the contributory base is lower than the assumed rate of return on the CPP assets, the pay-as-you-go component assets and liabilities are much higher if the rate of growth in the contributory base is used as the discount rate. However, the Plan's asset excess or shortfall is generated only by the funded component and remains the same regardless of which discount rate is used for the pay-as-you-go component. Therefore, although the total Plan's liabilities increase from $2 trillion to $5.7 trillion, the asset shortfall remains at $7 billion.

The funded component's share of the total obligations decreases to 3% if the growth in the contributory base is used as a discount rate for the pay-as-you-go component. While the funded component may appear to be small, the impact of the Plan's exposure to the financial market risk on the stability of the CPP contribution rate should not be underestimated. Both short-term and long-term negative market experiences could result in an increase in the minimum contribution rate above the legislated rate of 9.9%, as illustrated in the Uncertainty of Results section of the 25th CPP Actuarial Report.

B. Sensitivity Analysis of the Funded Component

The financial sustainability of a partially funded social security system is affected by various factors such as a country's economic growth, its demographic profile, as well as the ability of a system's assets to generate sufficient investment income. Different environments impact a system's contributions and/or expenditures, as well as assets needed to pay its expenditures. These impacts vary as to their extent and timing. For example, the economic growth of a country affects its system's contributions and expenditures through labour force participation rates, the rate of unemployment, and the growth in participants' earnings. While the fluctuations in these factors immediately affect the system's contributions, there could be some time before the effect on expenditures will be seen.

This subsection discusses the impacts of different demographic, economic and financial market environments other than those assumed under the best-estimate scenario on the assets and liabilities of the funded component of the Plan. This section concentrates on the funded component of the Plan, since this component determines the degree of exposure of the whole Plan to the financial market risk.

The impacts are illustrated using the low-cost and high-cost assumptions for the total fertility rate, mortality rates, real-wage differential and real rate of return on assets, as considered in the 25th CPP Actuarial Report. Table 9 below summarizes the assumptions used.

Table 9 Individual Sensitivity Tests

	Scenario	Assumption	
Total Fertility Rate (number of children per woman)	Higher Total Fertility Rate - Low Cost	1.90	
	Best Estimate	1.65	
	Lower Total Fertility Rate - High Cost	1.40	
		Life Expectancy in 2050 at age 65 (years)	
		Males	Females
Mortality Rates	Higher Mortality Rates - Low Cost	19.2	20.2
	Best Estimate	22.6	24.6
	Lower Mortality Rates - High Cost	25.2	27.9
Real-Wage Differential	Higher Real-Wage Differential - Low Cost	1.9%	
	Best Estimate	1.3%	
	Lower Real-Wage Differential - High Cost	0.7%	
Real Rate of Return	Higher Real Rate of Return - Low Cost	4.8%	
	Best Estimate	4.0%	
	Lower Real Rate of Return - High Cost	3.2%	

This subsection also introduces the concept of a "breakeven contribution rate". The breakeven contribution rate is defined as the contribution rate that results in the elimination of asset excess or shortfall, that is, the rate needed to be charged such that the obligations of the Plan would be equal to its assets under the open group approach. While the steady-state rate is defined as a rate that results in the asset to expenditure ratio being equal at two points of time, the breakeven

contribution rate does not impose any restrictions on the relative sizes of asset and expenditures. However, the breakeven contribution rate will be affected by the length of the projection period used. As such, even if both rates could be used in assessing the financial sustainability of the Plan, they are not necessarily equal.

Total Fertility Rate

The balance sheets for the Plan's funded component under the higher and lower total fertility rate scenarios using the legislated 9.9% contribution rate are presented in Table 10. The higher total fertility rate leads to an increase in the number of contributors in the mid- and long-terms and eventually to an increase in the amount of benefits paid in the long-term. Thus, the total obligations of the Plan are higher. At the same time, the higher volume of contributions results in a bigger share of future expenditures being covered by the pay-as-you-go component, and thus in lower obligations for the funded component. As at 31 December 2009, the funded component obligations under the higher total fertility rate scenario are $72 billion compared to $159 billion under the best-estimate scenario, which results in an asset excess of $81 billion.

In comparison, under the lower total fertility rate scenario, there are fewer contributors and thus eventually less benefits being paid, leading to lower total CPP obligations. However, a lower volume of contributions leads to less expenditures being financed through the pay-as-you-go component. Thus, the funded component obligations increase significantly to $232 billion resulting in an asset shortfall of $80 billion.

Table 10 also demonstrates the degree to which the Plan could be exposed to financial market risk depending on the demographic environment. Such exposure is driven by the size of the obligations of the funded component, which can vary considerably in response to the given demographic environment. Demographic environments leading to a higher volume of contributions move the Plan closer to pay-as-you-go financing, reducing the size of the funded component obligations and, therefore, the Plan's exposure to financial market risk. In comparison, a decreasing volume of contributions increases the Plan's reliance on the invested assets as a source of financing of future expenditures, and increases its exposure to financial market risk.

The breakeven contribution rate is 9.5% for the higher total fertility rate scenario and 10.4% for the lower fertility rate scenario.

Table 10 Open Group Funded Component Balance Sheet: Sensitivity to Fertility Rate
As at 31 December 2009 (9.9% contribution rate)

	Total Fertility Rate		
	Best-Estimate 1.65	**Higher 1.90**	**Lower 1.40**
Funded Component			
Assets			
PV of Future Contributions in Excess of Future Expenditures	25	26	25
Current Assets	127	127	127
Total Assets for funded component **(a)**	152	153	152
Liabilities			
PV of Future Expenditures Not Covered by Future Contributions **(b)**	159	72	232
Asset Excess (Shortfall) (a) - (b)	**(7)**	**81**	**(80)**

Mortality Rates

The balance sheets for the Plan's funded component under the higher and lower mortality rates scenarios using the legislated 9.9% contribution rate are presented in Table 11. Under the higher mortality rates scenario, fewer individuals reach retirement age, and the payment period for beneficiaries is shorter. This scenario leads to lower volume of contributions and lower expenditures, the latter effect being greater mainly due to shorter duration of benefit payments durations. As such, the total obligations of the Plan, as well as the obligations for both the pay-as-you-go and funded components, are lower. As at 31 December 2009, the funded component obligations under the higher mortality rates scenario are $26 billion, compared to $159 billion under the best-estimate scenario. In addition, the lower expenditures result in an increased present value of future contributions in excess of future expenditures of $31 billion, compared to $25 billion under the best-estimate scenario. Therefore there is an asset excess of $132 billion.

The lower mortality rates scenario leads to higher life expectancy at age 65, and, therefore to higher expenditures. At the same time, since the best-estimate mortality rates before age 65 are already very low, under this scenario there will be almost no change to the contributions stream. Therefore, while the total obligations of the Plan are higher, its pay-as-you-go component obligations are virtually unaffected. The burden of financing the increased expenditures falls on the funded component, as its obligations significantly increase to $248 billion, resulting in an asset shortfall of $97 billion.

The breakeven contribution rate is 9.1% for the higher mortality rates scenario and 10.4% for the lower mortality rates scenario.

Table 11 Open Group Funded Component Balance Sheet: Sensitivity to Mortality Rates
As at 31 December 2009 (9.9% contribution rate)

	Mortality Rates		
	Best-Estimate	Higher	Lower
	Life Expectancy in 2050 at age 65:		
	Male: 22.6 Female: 24.6	Male: 19.2 Female: 20.2	Male: 25.2 Female: 27.9
Funded Component			
Assets			
PV of Future Contributions in Excess of Future Expenditures	25	31	24
Current Assets	127	127	127
Total Assets for funded component **(a)**	152	158	151
Liabilities			
PV of Future Expenditures Not Covered by Future Contributions **(b)**	159	26	248
Asset Excess (Shortfall) (a) - (b)	**(7)**	**132**	**(97)**

Real-Wage Differential

Table 12 presents the balance sheets for the Plan's funded component under the higher and lower real-wage differential scenarios using the legislated contribution rate of 9.9%.

Under the higher real-wage differential scenario, higher earnings lead to higher contributions and eventually to higher benefits being paid. Similar to the higher total fertility rate scenario, while the total obligations of the Plan increase, the pay-as-you-go component finances a higher share of future expenditures, thereby reducing the funded component obligations. As at 31 December 2009, the funded component's obligations under the higher real-wage differential scenario are $54 billion, compared to $159 billion under the best-estimate scenario. In addition, the higher volume of contributions results in a longer period of time during which contributions exceed expenditures. The present value of future contributions in excess of future expenditures increases to $39 billion, compared to $25 billion under the best-estimate scenario. It results in an asset excess of $112 billion.

Under the lower real-wage differential scenario, lower earnings produce a lower stream of contributions, and, eventually, a lower stream of benefits. Once again, the lower volume of contributions leads to a lower share of expenditures being financed by the pay-as-you-go component. Thus, the funded component obligations increase to $227 billion resulting in an asset shortfall of $76 billion.

The breakeven contribution rate is 9.4% for the higher real-wage differential scenario and 10.4% for the lower real-wage differential scenario.

Table 12 Open Group Funded Component Balance Sheet: Sensitivity to Real-Wage Differential
As at 31 December 2009 (9.9% contribution rate)

	Real-Wage Differential		
	Best-Estimate 1.3%	**Higher 1.9%**	**Lower 0.7%**
Funded Component			
Assets			
PV of Future Contributions in Excess of Future Expenditures	25	39	24
Current Assets	127	127	127
Total Assets for funded component **(a)**	152	166	151
Liabilities			
PV of Future Expenditures Not Covered by Future Contributions **(b)**	159	54	227
Asset Excess (Shortfall) (a) - (b)	**(7)**	**112**	**(76)**

Real Rate of Return on Assets

Changes in financial market returns do not affect the stream of contributions and expenditures for both the pay-as-you-go and the funded components of the Plan under the legislated contribution rate of 9.9%. The size of the funded component obligations depends directly on the expected rate of return on assets, since the cash flows of this component are discounted at this rate. Therefore, a higher expected real rate of return leads to lower obligations for the funded component, and vice versa. As shown in Table 13, under the higher real rate of return scenario, the funded component liabilities decrease to $101 billion, resulting in an assets excess of $51 billion. Under the lower real

rate of return scenario, the funded component obligations increase to $271 billion, producing an asset shortfall of $118 billion.

The breakeven contribution rate is 9.5% for the higher real rate of return scenario and 10.4% for the lower real rate of return scenario.

Table 13 Open Group Funded Component Balance Sheet: Sensitivity to Real Rate of Return on Assets
As at 31 December 2009 (9.9% contribution rate)

	Real Rate of Return		
	Best-Estimate	Higher	Lower
	4.0%	4.8%	3.2%
Funded Component			
Assets			
PV of Future Contributions in Excess of Future Expenditures	25	25	26
Current Assets	127	127	127
Total Assets for funded component (a)	152	152	153
Liabilities			
PV of Future Expenditures Not Covered by Future Contributions (b)	159	101	271
Asset Excess (Shortfall) (a) - (b)	**(7)**	**51**	**(118)**

The provisions of the *Canada Pension Plan* including its strong regular review process by Ministers of Finance ensure the continual monitoring and management of the financing of the Plan. The sensitivity analyses presented in this subsection highlight the importance of managing the risks that the Plan could face from varying demographic, economic or financial market environments. The CPP is unique in terms of the structure and long-term nature of its obligations, the associated contributions and assets that must cover those obligations, and the dynamics between them. Further, although the main source of financing the Plan's future expenditures comes from its future contributions, the importance of the funded portion of the Plan should not be underestimated. As such, ensuring the Plan's long-term financial sustainability requires regularly assessing the characteristics of and the relationship between its assets and obligations.

VI. International Comparisons

This section discusses financial measures used in the assessment of the long-term financial sustainability of the Old-Age, Survivors and Disability Insurance program in United States and the Inkomstpension system in Sweden. These measures are then applied to the CPP. It should be noted that while it is instructive to examine the financial position of the CPP using these alternative measures, the main indicator of the CPP's financial sustainability remains the steady-state contribution rate, in particular its adequacy and stability over time. Therefore, the measures presented in this section should be viewed as illustrations.

A. U.S. Old-Age, Survivors, and Disability Insurance (OASDI) Program

The U.S. OASDI program is an earnings-related defined benefit social security program that provides old-age, survivor and disability benefits to insured participants. Similar to the CPP, the benefits are based on adjusted career-average earnings. The program is financed mainly on a pay-as-you-go basis with trust funds aimed at covering short-term fluctuations.

The Annual Reports of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds (the Trustees Reports) in the United States analyze the financial sustainability of the OASDI program using a measure known as the actuarial balance. The actuarial balance is a measure based on the open group approach and represents the difference between present values of annual incomes and expenditures over a selected projection period expressed as a percentage of the present value of contributory earnings over the same period. An actuarial balance of zero for any period indicates that the estimated cost for the period is met, on average, with assets remaining at the end of the period equal to the following year's expenditures. A negative actuarial balance indicates that, over the period, the present value of income to the program plus existing assets is less than the present value of program expenditures plus the cost of accumulating assets equivalent to one year's expenditures by the end of the period.

The Trustees Reports present short-term as well as long-term actuarial balances under a variety of assumptions, namely intermediate, low-cost and high-cost scenarios. The long-term actuarial balance is determined over a 75-year period. As was mentioned earlier, the present values used to determine the components of the actuarial balance are based on the effective yield on the trust funds assets. The ultimate intermediate assumed nominal effective yield as of 31 December 2009 (2010 Trustees Report) is 5.7% (2.9% real).

Table 14 summarizes the actuarial balances over a 75-year horizon for the CPP and the OASDI program as at 31 December 2009. This table compares the financial status of both social security programs. The CPP figures are calculated using the expected rate of return on the CPP assets.

Table 14 Components of 75-Year Actuarial Balance (2010-2084)[1]
Best-Estimate Assumptions
(9.9% contribution rate for the CPP)

Item:	CPP	OASDI[3]
Present Value as at 31 December 2009 of (in $ billions[2])		
Contribution Revenue (income) (a)	1,533	40,118
Plan Expenditures (b)	1,609	48,065
Income minus Plan Expenditures (c) = (a) –(b)	(76)	(7,947)
Fund Assets at Start of Period (d)	127	2,540
Open Group Asset Excess (Shortfall) (e) = (d) + (c)	51	(5,407)
Ending Fund Target (f)	10	441
Open Group Asset Excess (Shortfall) minus Ending Fund Target (g) = (e) – (f)	41	(5,848)
Contributory Earnings (h)	14,978	304,530
Percent of Contributory Earnings		
Actuarial Balance (100 x g ÷ h)	**0.27**	**(1.92)**

(1) Expenditures include associated administrative expenses.
(2) Canadian dollars for the CPP and US dollars for the OASDI program.
(3) From 2010 Trustees Report page 63, Table IV.B5

The figures in Table 14 for the OASDI program are according to the 2010 Trustees Report. In the most recent 2011 Trustees Report, the 75-year actuarial balance for the period 2011-2085 under the intermediate assumptions is determined to be -2.22.

The positive actuarial balance of the CPP confirms its financial sustainability under the current legislation and the best-estimate assumptions, while the negative actuarial balance of the OASDI program is an indicator that the program in its current form is not financially sustainable over the long term. It should also be noted that the OASDI program actuarial balance methodology targets assets at the end of the projection period equal to one year's worth of expenditures. On the other hand, the CPP steady-state financing methodology results in the assets equal to five years' worth of expenditures at the end of 2084 (under the best-estimate assumptions and the legislated contribution rate of 9.9%).

In addition to the actuarial balance measure, the Trustees Reports analyze the OASDI program's open group balance sheet using both a 75-year horizon and an infinite horizon. Table 15 compares the open group balance sheets for the CPP and the OASDI program. As indicated in the table, the figures for the present values of contribution revenue and expenditures under the extended horizon projections are not available for the OASDI program.

Table 15 Open Group Balance Sheet for 75-Year Period (2010-2084) and Extended Period Best-Estimate Assumptions
(9.9% contribution rate for the CPP)

	CPP		OASDI [2]	
Present Value as at 31 December 2009 (in $ billion[1])	**75-Year Period (2010-2084)**	**Extended Period (150 years)**	**75-Year Period (2010-2084)**	**Extended Period (infinity)**
Assets				
Current Assets	127	127	2,540	2,540
Future Contributions (Contribution Revenue)	1,533	1,861	40,118	N/A
Total Assets (a)	1,660	1,988	42,658	N/A
Liabilities[3] (b)	1,609	1,995	48,065	N/A
Asset Excess (Shortfall) (a) – (b)	51	(7)	(5,407)	(16,100)
Total Assets as a Percentage of Total Liabilities (%) (a)/(b)	103.2%	99.7%	88.8%	N/A

(1) Canadian dollars for the CPP and US dollars for the OASDI program.
(2) From 2010 Trustees Report page 63, Table IV.B5 and page 65, Table IV.B6.
(3) Liabilities include administrative expenses.

Table 15 illustrates that the length of the projection period has an impact on the size of the asset excess or shortfall. Under the 75-year projection period, the CPP has an asset excess of $51 billion, compared to an asset shortfall of $7 billion under an extended projection period. Similarly, for the OASDI program, the asset shortfall is lower if the 75-year projection period is used compared to an extended time horizon projection. The limiting of the projection period to 75 years excludes from the liabilities part of the future expenditures for cohorts that will enter the labour force during the projection period. However, most of the contributions for these cohorts are included in the assets. This fact is recognized by the Trustees Reports, and while financial measures over a 75-year period are historically used to assess the financial sustainability of the OASDI program, the Trustees Reports emphasize the importance of analysis over an extended time horizon. On the other hand, as previously noted, the uncertainty of projections increases with the length of the projection period.

B. Inkomstpension System in Sweden

Description of Inkomstpension System in Sweden

The Swedish Inkomstpension system is an earnings-related notional defined contribution (NDC) scheme. Under this system, individual notional accounts are maintained for the scheme's participants. The accounts increase every year with new contributions and are indexed using the income index determined on the basis of the growth in average income. At retirement, the accumulated individual notional account is converted into an annuity. The conversion assumes an imputed interest rate of 1.6% which corresponds to the assumed nominal growth in wages. Pensions in pay are increased or decreased every year by the difference between the actual income index and the implied growth of 1.6%.

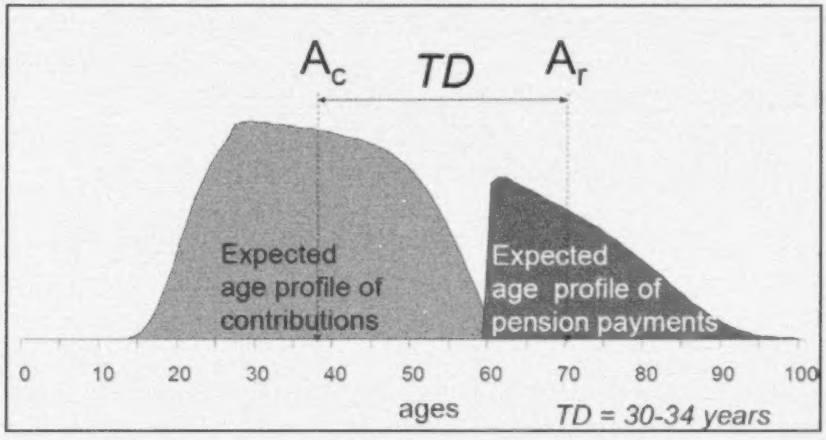
The Inkomstpension is financed as a pay-as-you-go social security scheme where pension contributions received are used to pay pension disbursements of the same year. Differences between contributions received and pensions paid are transferred to a buffer fund.

The financial sustainability of the Inkomstpension system is assessed through the means of a "modified" closed group without future accruals balance sheet. Unlike the traditional closed group

without future accruals balance sheet which was discussed in Section IV, the modified one includes a "contribution asset" on the assets side in addition to the assets held in the buffer fund. As discussed, pure pay-as-you-go as well as partially funded systems by design do not possess a fund sufficient to cover the system's liabilities. The concept of the contribution asset developed in Sweden recognizes that a pay-as-you-go or partially funded system does not have any legal requirement to hold assets to fully guarantee its liabilities. Since such a system relies on contributions as a major source of its financing, it implies that the flow of future contributions represents an asset for the system.

The contribution asset is calculated as the product of the most recent year's contributions to the system and the average time during which the liabilities generated by these contributions are expected to remain in the system. This time is called the "turnover duration". Chart 3 illustrates the turnover duration concept. The shaded area on the left-hand side of the chart corresponds to the contributions distribution by age of contributors. The shaded area on the right-hand side of the chart corresponds to the benefits distribution by age of beneficiaries. The turnover duration is the difference between the benefit-weighted average age of beneficiaries (A_r) and the contributions-weighted average age of contributors (A_c) based on the profile of the system's participants at the time of the valuation. It could also be viewed as the sum of the expected pay-in and pay-out durations. The assets side of the Swedish balance sheet consists of the sum of the buffer fund value and the contribution asset.

Chart 3 Illustration of Turnover Duration (TD) Concept[5]



The liabilities side of the Swedish balance sheet includes the accrued liability for current beneficiaries and current contributors. The accrued liability for current contributors is calculated as the sum of the balances of individual account values, which are readily available. The accrued liability for current beneficiaries is the sum of the present values of current benefits in pay determined using the imputed interest of 1.6%[6] and the observed mortality.

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[5] Chart 3 is taken from O. Settergren's presentation at the 16th International Conference of Social Security Actuary and Statisticians, Ottawa, 2009. This presentation may be accessed at the following web site:http://www.osfi-bsif.gc.ca/app/DocRepository/1/eng/oca%5Cissa%5Ctheme2%5CS3%20-%205%20-%20ISSA%20Ottawa%202009%20-%20Ole_Settergren%2015%20min.pdf

[6] In this calculation, it is assumed that benefits in pay are indexed using the difference between the income index and the imputed interest of 1.6%. Further, these benefits are discounted using the income index. The net result is discounting of benefits using the imputed interest rate of 1.6%.

The ratio of the assets to the liabilities is called the balance ratio. If this ratio is less than one, an automatic balance mechanism is activated, whereby the indexation of accounts and pensions in pay is reduced in order to restore the financial sustainability of the system. When the balance ratio reverses to values higher than one, the automatic balance mechanism allows for indexation at a rate higher than the change in the income index. This period of higher indexation lasts until the cumulative indexation reaches the level where it would have been if the automatic balancing had never been applied.

The practical application of the Swedish automatic balance mechanism involves several smoothing techniques. In particular, starting from 2008, the three-year mean value of the buffer fund is used in order to determine the balance ratio. Prior to 2008, the balance ratio was calculated using the market value of the buffer fund as at 31 December of the respective year (this measure is now called the "financial position"). The current mechanism reduces the impact on indexation arising from a single year's loss in assets in the buffer fund. As a result, instead of being recognized all at once, the impact is spread over a longer period of time.

For a more detailed description of the mathematics underlying the Swedish system accounting and the operation of the automatic balance mechanism, the reader is referred to Settergren (2001), Settergren and Mikula (2005), Settergren (2009), and the Orange Report - Annual Report of the Swedish Pension System (2010).

The Orange Report is published annually and provides detailed information on the financial status of the Inkomstpension. Table 16 presents the information on the financial position of the Inkomstpension based on the most recent 2010 Orange Report.

Table 16 Financial Position of the Inkomstpension – 2010 Orange Report

Nine-Year Review
Billions of SEK[7]

	2010	2009	2008	2007	2006	2005	2004	2003	2002
Buffer Fund Mean Value (a)	810	811	821						
Buffer Fund (b)	895	827	707	898	858	769	646	577	488
Contribution Asset (c)	6,575	6,362	6,477	6,116	5,945	5,712	5,607	5,465	5,301
Total Asset (d) = (b)+(c)	7,469	7,189	7,184	7,014	6,803	6,490	6,253	6,042	5,789
Pension Liability (e)	7,367	7,512	7,428	6,996	6,703	6,461	6,244	5,984	5,729
Results Brought Forward (Assets Excess (Shortfall)) (d)-(e)	103	(323)	(243)	18	100	28	9	58	60
Balance Ratio ((a)+(c))/(e)	1.0024	0.9549	0.9826	1.0026	1.0149	1.0044	1.0014	1.0097	1.0105
Financial Position[(1)] **(d)/(e)**	1.0140	0.9570	0.9672	1.0026	1.0149	1.0044	1.0014	1.0097	1.0105
Smoothed Turnover Duration[(2)]	31.67	31.76	31.76	31.93	32.05	32.12	32.40	32.40	32.32

(1) The balance ratio according to the previous definition (through 2007), that is, calculated solely on the basis of the market value of the buffer funds as of December 31 of the respective year.
(2) Years 2002 to 2006 figures come from Settergren (2011)

At the end of 2009, the assets of the system were 7.2 trillion of Swedish kronor (SEK), with SEK 827 billion coming from the buffer fund and the rest from the contribution asset. The pension liability of the system was SEK 7.5 trillion. The balance ratio, based on the three years mean value of the buffer fund of SEK 811 billion, was calculated to be 0.9549, and the financial position determined using the market value of the buffer fund was 0.9570.

[7] 1 SEK is equal approximately to $0.15 CAN.

The automatic balance mechanism was activated for the first time at the end of 2008 following the sharp fall in the value of the buffer fund as a result of the global financial crisis. At that time, the balance ratio was calculated to be 0.9826, and the 2010 indexation of accounts and benefits was reduced. The automatic balance mechanism was applied again at the end of 2009, affecting the 2011 indexation. By the end of 2010, as a result of the reductions in benefits in pay and accrued pension rights (account balances), the balance ratio had improved to 1.0024 implying that in 2012 the recovery period will start and the rate of indexation will be higher than the income index. If the pre-2008 rules for the calculation of the balance ratio were applied, the 2008 buffer fund loss would be recognised fully in the 2010 indexation. Under the old rules the 2010 indexation would be lower, and both the 2011 and 2012 indexations would be higher.

Applications of the Contribution Asset Concept to the CPP Balance Sheet

The Swedish methodology of assessing the financial sustainability of the Inkomstpension system cannot be applied automatically to the CPP. The main reason is that there are major differences in the designs of the two plans, the Inkomstpension being an NDC system, and the CPP being a defined benefit plan. The nature of an NDC system, the indexation provisions of the Inkomstpension system, as well as the automatic balance mechanism, minimize the need for actuarial projections and, therefore, minimize the number of assumptions that should be made for the future. This is not the case for defined benefit plans, and the CPP in particular, where the assessment of the Plan's financial sustainability is based on extensive actuarial projections.

In this section, we modify the closed group without future accruals balance sheet for the CPP by applying the Swedish contribution asset concept. The introduction of the contribution asset on the assets side of the closed group without future accruals balance sheet allows for taking into account the partially funded nature of the CPP.

The calculations are performed using the best-estimate assumptions of the 25th CPP Actuarial Report with the exception of the discount rate. Since the calculation of the contribution asset is based on future contributions, a discount rate equal to the growth in the contributory base appears to be the most appropriate choice.

In attempting to apply the notion of a contribution asset to a partially funded defined benefit plan's balance sheet, several points should be noted. Firstly, while the Inkomstpension system's balance sheet is presented using the closed group without future accruals approach, the contribution asset's theoretical foundation is based on a closed group with future accruals approach (see Settergren and Mikula (2005)). These two closed group approaches are equivalent under the NDC design, since the values of future contributions and future benefit accruals for current participants are equal by definition. Even if this is not the case for the CPP, this study presents a simplified situation that ignores the difference between present values of future contributions and future benefit accruals, if any, for current contributors.

Secondly, the turnover duration is calculated using the profile of the contributors and beneficiaries in the year of calculation. Therefore, average money-weighted ages of contributors and beneficiaries do not take into account future mortality improvements. On the other hand, CPP liabilities are determined using cohort mortality, i.e. by taking into account assumed future mortality improvements. If the assumed future mortality improvements were ignored, the closed group without future accruals liabilities for the CPP would be somewhat lower.

Finally, no smoothing techniques similar to the ones used in the Orange Report are applied in the calculation of the contribution asset for the CPP.

Table 17 presents the CPP modified closed group without future accruals balance sheet that takes into account the contribution asset. The expected turnover duration for the CPP is estimated to be 31 years on the basis of the contributors and beneficiaries in 2009, and 30 years on the basis of the projected contributors and beneficiaries in 2019. The decrease in the expected turnover duration from 2009 to 2019 is mainly due to the aging of the labour force, which results in an increase in the contributions-weighted average age of contributors from 41.5 years in 2009 to 42.3 years in 2019.

Table 17 Closed Group without Future Accruals Balance Sheet with Contribution Asset
Discount Rate: Growth in Contributory Base
(9.9% contribution rate)

Present Value as at 31 December (in $ billion)	2009	2019
Modified Closed Group Without Future Accruals		
Assets		
Current Assets (a)	127	258
Contribution Asset		
- Last year contributions (b)	36	54
- Turnover Duration (years) (c)	31	30
- Contribution Asset (d) = (b) x (c)	1,120	1,605
Total Assets (e) = (a) + (d)	1,247	1,863
Liabilities[1]		
Current Benefits (f)	342	630
Future Benefits (g)	841	1,247
Total Liabilities (h) = (f) +(g)	1,183	1,877
Asset Excess (Shortfall) (i) = (e) – (h)	**64**	**(14)**
Total Assets as a Percentage of Total Liabilities (Financial Position) (e)/(h)	**105.4%**	**99.3%**

(1) Liabilities include administrative expenses.

The current CPP assets together with the contribution asset are sufficient to finance the accrued liabilities of the CPP. The total assets as a percentage of total liabilities figure corresponds to the financial position concept of the Inkomstpension system. At the end of the 2009, the financial position of the Inkomstpension system was close to 96%. The financial position of the CPP at the same date, as measured under a closed group without future accrual methodology that includes a contribution asset, is 105%, confirming that the CPP is financially sustainable.

VII. Conclusion

Major amendments in 1997 led to the change in financing of the Canada Pension Plan from a pay-as-you-go basis to a form of partial funding called steady-state funding. The 1997 Amendments, and particularly steady-state funding, restored the Plan's financial sustainability for current and future generations. The purpose of the steady-state financing methodology is to produce an asset/expenditure ratio that is relatively stable over time.

From its inception, the CPP was never intended to be a fully funded plan. Instead, under steady-state funding, the goal is to build a reserve of assets such that investment income on this pool of assets will help to pay benefits when needed (for example, as the large cohort of baby boomers retires). From 2000 to 2020, the net cash flows of the Plan, that is, contributions less expenditures, are expected to be positive, resulting in an increase in the Plan's assets and asset/expenditure ratio.

Although a number of approaches may be used to assess the Plan's financial status, the key financial measure for evaluating the Plan is the steady-state contribution rate, in particular its adequacy and stability over time.

Partially funded systems, as well as pay-as-you-go ones, represent social contracts where, in any given year, current contributors allow the use of their contributions to pay current beneficiaries' benefits. Such social contracts create claims for current and past contributors to contributions of future contributors. The proper assessment of the financial sustainability of a social security pay-as-you-go or partially funded system by means of its balance sheet should take into account these claims. The traditional closed group methodologies do not reflect these claims since only current participants are considered. On the contrary, the open group approach accounts explicitly for these claims by considering the benefits and contributions of both the current and future plan's participants.

Given the long-term nature of the CPP, the fact that its stewards are the federal, provincial and territorial governments, and the strong governance and accountability framework of the Plan, it is unlikely that the Plan would become insolvent. Therefore, if the Plan's financial sustainability is to be measured based on its asset excess or shortfall, it should be done so on an open group basis that reflects the partially funded nature of the Plan, that is, its reliance on both future contributions and invested assets as means of financing future expenditures. The inclusion of future contributions and benefits with respect to both current and future contributors in the assessment of the Plan's financial status shows that the Plan is able to meet its financial obligations and is sustainable over the long term.

Future demographic, economic and financial market environments may differ from those assumed under the best-estimate scenario of the 25th CPP Actuarial Report, and, as such, may impact the Plan's finances differently. As different environments unfold over time, the Plan's stakeholders, as part of their regular reviews of the Plan, will need to consider the benefit and contribution structure of the Plan in light of how each side of the balance sheet is affected. In any case, regardless of which measure is used to assess the Plan's financial status, the unique characteristics of the Plan's long-term obligations and the assets needed to meet those obligations, as well as the dynamics between them should all be considered in ensuring the long-term financial sustainability of the CPP.

VIII. Appendices

A. Principles to Guide Federal-Provincial Decisions on the Canada Pension Plan

This appendix presents the nine guiding principles that were formally put forth by the Plan's stakeholders as part of the CPP review of the late 1990s. At the time, the legislated contribution rate was set to increase to 10.1% (as mentioned in Principle 4) in accordance with a schedule of contribution rates, which was also shown in the 13th Actuarial Report on the CPP as at February 1992 and shown or discussed in several subsequent actuarial reports. This schedule was later replaced by a revised schedule as part of the amendments (see Table 2 in Section III.B). In addition, a Seniors Benefit (mentioned in Principle 2) had been proposed in the 1996 Federal Budget to replace the basic Old Age Security benefit and Guaranteed Income Supplement in 2001, but which was in fact subsequently revoked before it came into effect.

The nine guiding principles and the context surrounding them at the time of the review were as follows:

Following extensive consultations across Canada on the Canada Pension Plan, governments agreed that they must put to rest the worries that Canadians have that their CPP pensions will not be there for them when they retire in the future. They therefore agreed that they must solve the problems facing the CPP quickly, and that they will be guided by the following principles in doing so:

1. The CPP is a key pillar of Canada's retirement income system that is worth saving.
2. The CPP is an earnings-related program. Its fundamental role is to help replace earnings upon retirement or disability, or the death of a spouse – not to redistribute income. The income redistribution role is the responsibility of the income tax system, the Old Age Security/Guaranteed Income Supplement/Seniors Benefit, and other income-tested programs paid from general tax revenues.
3. The solutions to the CPP's problems must be fair across generations and between men and women.
4. The CPP must be affordable and sustainable for future generations. This requires fuller funding and a contribution rate no higher than the already legislated future rate of 10.1 per cent. In deciding how quickly to move to this rate, governments must take economic and fiscal impacts into account.
5. Governments must tighten administration as the first step towards controlling costs.
6. Disability and survivor benefits are important features of the CPP. However, they must be designed and administered in a way that does not jeopardize the security of retirement pensions.
7. Any further benefit improvements must be fully funded.
8. CPP funds must be invested in the best interests of plan members, and maintain a proper balance between returns and investment risk. Governance structures must be created to ensure sound fund management.
9. Governments must monitor changing economic, demographic, and other circumstances which can affect the CPP, and act to respond to these changing conditions. Annually, Ministers of Finance should provide Canadians with the appropriate information so they can judge for themselves that the integrity and security of the CPP is being protected.

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C. Acknowledgements

The following people assisted in the preparation of this study:

Assia Billig, Ph.D., F.S.A., F.C.I.A.
Patrick Dontigny, A.S.A.
Laurence Frappier, F.S.A., F.C.I.A.
Sari Harrel, F.S.A., F.C.I.A.
Lyse Lacourse
Jean-Claude Ménard, F.S.A., F.C.I.A.
Michel Millette, F.S.A., F.C.I.A.
Michel Montambeault, F.S.A., F.C.I.A.

We would like to also express our gratitude to Ole Settergren for answering our questions regarding the Inkomstpension system, reviewing the section of this Study dedicated to the Swedish system and providing valuable feedback.